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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/723,517	11/26/2003	Jai-Hyung Won	8028-36 (SPX200306-0004 U	8995

22150 7590 09/12/2005

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EXAMINER	
TRINH, MICHAEL MANH	
ART UNIT	**PAPER NUMBER**
2822	

DATE MAILED: 09/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/723,517	WON ET AL.	
	Examiner	Art Unit	
	Michael Trinh	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 June 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

*** This office action is in response to Applicant's Amendment filed on June 20, 2005. Claims 1-26 are pending, in which claims 25-26 have been newly added.

*** The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 103

1. Claims 1,4-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Papasouliotis et al (6,846,745).

Papasouliotis teaches a high-density plasma CVD process comprising the steps of: preparing a semiconductor substrate; loading the semiconductor substrate into a process chamber; and injecting first main process gases including a silicon source gas (col 6, lines 41-67), an oxygen gas (col 7, lines 1-8), with silicon tetrafluoride (SiF_4) also acted as a nitrogen free chemical etching gas (col 7, lines 14-15; Abstract; col 9, lines 1-19), a hydrogen gas (col 6, lines 50-55; col 9, lines 45-61; col 15, lines 5-34), and a helium gas (re claim 13; col 6, lines 49-51; col 16, lines 1-3; col 7, lines 16-21) into the process chamber to generate a high density plasma over the semiconductor substrate and to simultaneously form a silicon oxide layer on the semiconductor substrate (Figs 2A-2B, col 6, line 9 through col 8), wherein the semiconductor substrate is heated to a temperature in a range of about 480 °C to about 650 °C (col 8, lines 13). Re further claims 4 and 16, wherein the silicon source gas is silane or disilane (col 6, lines 56-65), and wherein silicon tetrafluoride (SiF_4) is also acted as a nitrogen free chemical etching gas (col 7, lines 14-15; abstract). Re further claims 5-12 and 17-26, wherein deposition to form the silicon oxide layer is repeated a number of time in order to fill the gaps on the semiconductor substrate (Figs 1A-1B and 2A-2B; col 8, lines 44-60), wherein in each initial deposition and subsequent deposition (e.g. first, second, third, fourth, etc.), the process gases are injected into the chamber for deposition of the silicon oxide layer, wherein the process gases include a silicon source gas, an oxygen gas, silicon tetrafluoride (SiF_4) acted as a nitrogen free chemical etching gas, a hydrogen gas, and/or a helium gas.

Papasouliotis does not mention a temperature in a range of about 550-700°C.

However, Papasouliotis also teaches the temperature in a range of about 450-750°C, preferably, in a range of about 480-650 °C (col 8, lines 1-13).

Therefore, the subject matter as a whole would have been obvious to one or ordinary skill in the art at the time the invention was made to select the portion of the prior art's range of temperature as taught by Papasouliotis, which is within the range of applicant's claims, because it has been held to be obvious to select a value in a known range by optimization for the best results, and would be an unpatentable modification, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In Re Aller* 104 USPQ 233,255 (CCPA 1955); *In re Waite* 77 USPQ 586 (CCPA 1948); *In Re Swanson* 56 USPQ 372 (CCPA 1942); *In Re Sola* 25 USPQ 433 (CCPA 1935); and *In Re Dreyfus* 24 USPQ 52 (CCPA 1934).

2. Claims 2-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Papasouliotis et al (6,846,745) taken with Hanawa (5,753,044).

Papasouliotis teaches a high-density plasma CVD process as applied to claims 1,4-26 above. Re claim 2, Papasouliotis also teaches (at Fig 3, col 11, line 55 through col 12, line 48) to use any of various high density plasma CVD (HDP-CVD) for performing the invention, wherein the high density plasma is generated by applying a plasma power to an electrode 305 installed outside the process chamber 303, and a bias power 315 to the semiconductor substrate 309 during the injection of the first main process gases. Re claim 3, Papasouliotis also teaches (at column 8, lines 27-43) the plasma power is in the range of 3000-5000 watts (3-5 kilowatts at col 8, lines 32-40), and the bias power is in the range of about 500 to 5000 watts (0.5-5 kilowatts at col 8, lines 27-31).

Re claim 2, Papasouliotis thus lacks mentioning the electrode 305 as an induction coil, and, re claim 3, lacks reciting the plasma power of about 2500-5000 watts and bias power of 800-4000 watts.

However, re claim 2, Hanawa teaches (at Figures 1-2,17-18; col 4, lines 39-65; Figs 17-18, col 7, lines 43-67) a high plasma density apparatus, wherein high density plasma is generated by applying a plasma power to an induction coil (18,60') installed outside the chamber as to increase the plasma ion density uniformity across the wafer surface. Re claim 3, Papasouliotis

already teaches (at column 8, lines 27-43) the plasma power is in the range of 200-10000 watts, preferably 3000-5000 watts (3-5 kilowatts at col 8, lines 32-40), and the bias power is in the range of about 2000-10000 watts, preferably about 500 to 5000 watts (0.5-5 kilowatts at col 8, lines 27-31).

Therefore, the subject matter as a whole would have been obvious to one or ordinary skill in the art at the time the invention was made to employ a high plasma density CVD reactor for depositing the silicon oxide layer of Papasouliotis by employing the high plasma density apparatus having the induction coil installed outside the chamber, as taught by Hanawa. This is because of the desirability to increase the plasma ion density uniformity across the wafer surface due to the induction coil so that the silicon oxide layer can be deposited in an uniform and effective manner. Also, the subject matter as a whole would have been obvious to one or ordinary skill in the art at the time the invention was made to select the portion of the prior art's range of plasma power and bias power, as taught by Papasouliotis, which is within the range of applicant's claims, because it has been held to be obvious to select a value in a known range by optimization for the best results, and would be an unpatentable modification, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In Re Aller* 104 USPQ 233,255 (CCPA 1955); *In re Waite* 77 USPQ 586 (CCPA 1948); *In Re Swanson* 56 USPQ 372 (CCPA 1942); *In Re Sola* 25 USPQ 433 (CCPA 1935); and *In Re Dreyfus* 24 USPQ 52 (CCPA 1934).

Response to Amendment

3. Applicant's arguments filed June 20, 2005 have been fully considered but they are not persuasive.

Applicant remarked that Papasouliotis suggests use the individual gases in various processes, but does not teach or suggest using various gases as part of the first main process gases.

In response, this is note and found unconvincing. Papasouliotis clearly teaches (at col 6, lines 41-67), a high-density plasma CVD process by injecting first main process gases including a silicon source gas, an oxygen gas (col 7, lines 1-8), with silicon tetrafluoride (SiF_4) also acted as a nitrogen free chemical etching gas (col 7, lines 14-15; Abstract; col 9, lines 1-19), a

hydrogen gas (col 6, lines 50-55; col 9, lines 45-61; col 15, lines 5-34), and a helium gas (re claim 13; col 6, lines 49-51; col 16, lines 1-3; col 7, lines 16-21) into the process chamber to generate a high density plasma over the semiconductor substrate and to simultaneously form a silicon oxide layer on the semiconductor substrate (Figs 2A-2B, col 6, line 9 through col 8), wherein the semiconductor substrate is heated to a temperature in a range of about 480 °C to about 650 °C (col 8, lines 13). A silicon oxide which may be doped or undoped can be formed by using these various gases during deposition (col 6, lines 42-55), wherein the semiconductor substrate is heated to a temperature in a range of about 480 °C to about 650 °C (col 8, lines 13), which is within the range of applicant's claims, because it has been held to be obvious to select a value in a known range by optimization for the best results, and would be an unpatentable modification, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In Re Aller* 104 USPQ 233,255 (CCPA 1955); *In re Waite* 77 USPQ 586 (CCPA 1948); *In Re Swanson* 56 USPQ 372 (CCPA 1942); *In Re Sola* 25 USPQ 433 (CCPA 1935); and *In Re Dreyfus* 24 USPQ 52 (CCPA 1934).

Claimed subject matter, not the specification, is the measure of invention. Limitations in the specification cannot be read into the claims for the purpose of avoiding the prior art. In Re Self, 213 USPQ 1,5 (CCPA 1982); In Re Priest, 199 USPQ 11,15 (CCPA 1978).

Employing the high plasma density apparatus having the induction coil installed outside the chamber, as taught by Hanawa, would have been obvious, because of the desirability to increase the plasma ion density uniformity across the wafer surface due to the induction coil so that the silicon oxide layer can be deposited in an uniform and effective manner. Selecting the portion of the prior art's range of plasma power and bias power, which is within the range of applicant's claims, because it has been held to be obvious to select a value in a known range by optimization for the best results, and would be an unpatentable modification, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In Re Aller* 104 USPQ 233,255 (CCPA 1955); *In re Waite* 77 USPQ 586 (CCPA 1948); *In Re Swanson* 56 USPQ 372 (CCPA 1942); *In Re Sola* 25 USPQ 433 (CCPA 1935); and *In Re Dreyfus* 24 USPQ 52 (CCPA 1934).

The rejection is outstanding and maintained as of record.

****

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

*** Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael M. Trinh whose telephone number is (571) 272- 1847. The examiner can normally be reached on M-F: 8:30 Am to 5:00 Pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number is (571) 273-8300

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.
Oacs-102

Michael Trinh
Primary Examiner